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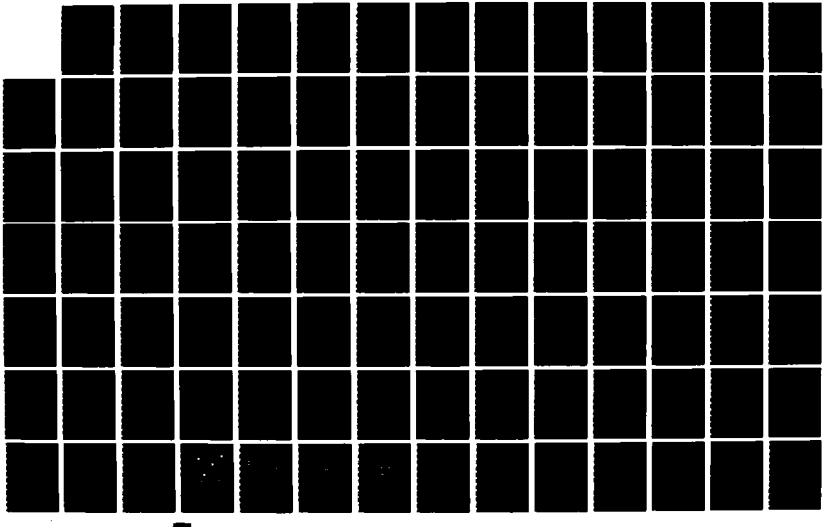

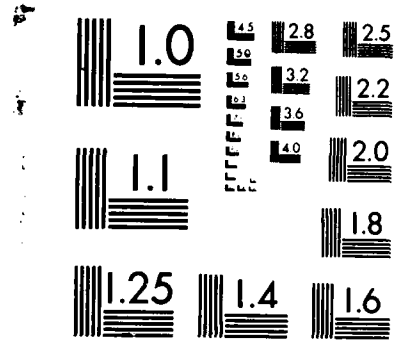

ASSESSING THE IMPACT OF RECENT COMPETITION RELATED LEGISLATION ON THE WORKLOAD OF SYSTEMS CONTRACTING PERSONNEL AT AIR FORCE SYSTEMS COMMAND PRODUCT DIVISIONS

THESIS

Mark E. Presar
Captain, USAF

AFIT/GLM/LSM/86S-61

DEPARTMENT OF THE AIR FORCE
AIR UNIVERSITY
AIR FORCE INSTITUTE OF TECHNOLOGY

Wright-Patterson Air Force Base, Ohio

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THESIS

Presented to the Faculty of the School of Systems and Logistics
of the Air Force Institute of Technology
Air University
In Partial Fulfillment of the
Requirements for the Degree of
Master of Science in Logistics Management

Mark E. Presar, B.S.
Captain, USAF

September 1986

PUBLIC
Approved for release; distribution unlimited

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Mark E. Presar

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Abstract

Public Law 98-369, The Competition in Contracting Act and Public Law 98-72, Commerce Business Daily, were recently enacted in response to "horror stories" regarding the Defense Department's supposed overspending on weapon systems and support equipment acquisitions. These two laws have brought sweeping changes to the Government acquisition process, in terms of new requirements for the processing of sole source and other less fully competitive actions, and in terms of the activities required to promote, enhance and sustain competitive procurement.

Although there have already been cost avoidance success stories resulting from this increased use of competition, very little attention has been given to the cost impact of the increased workload on the contracting personnel implementing the revised procedures. This research focused on the changes in manhours, and payroll and benefit costs, required to comply with these new laws within Air Force systems buying activities. Extensive historical data were collected and over 70 personal interviews were conducted at Air Force Systems Command buying divisions at Eglin AFB FL, Wright-Patterson AFB OH, Norton AFB CA, Hanscom AFB MA, and Los Angeles AFS CA to determine the average times spent on

the new procedures required for acquisitions with less than full and open competition. These processing time changes were then converted into payroll and benefit costs to assess the monetary impact. Additionally, linear regression and forecasting models were used to test for a workload shift toward the more labor intensive competitive source selection procedures which appeared to increase after the legislations' effective date.

The results of the interviews and the analysis of historical data revealed additional payroll and benefit costs in excess of $1 million. Perceptions of the workforce regarding the laws, along with conclusions, recommendations, and areas for further study, are presented.

ASSESSING THE IMPACT OF RECENT COMPETITION RELATED LEGISLATION ON THE WORKLOAD OF SYSTEMS CONTRACTING PERSONNEL AT AIR FORCE SYSTEMS COMMAND PRODUCT DIVISIONS

I. Introduction

Background

Over the past few years, television news programs, newspapers and magazines have been replete with the "horror stories" regarding the Defense Department's apparent over-spending on weapon systems and, particularly, related support equipment (5; 19:1; 24). Congress and the President have understandably reacted to these allegations of waste with several Public Laws and Executive Orders. The primary intent of such reform attempts has been to foster increased competition in all phases of the acquisition process, which allows market forces to set prices and, thus, avoid the reoccurrence of this misuse of the taxpayers' money (35; 36).

Two particular laws recently passed by Congress, Public Law (PL) 98-72, "Commerce Business Daily", and Public Law 98-369, the "Competition in Contracting Act" or CICA, took effect on 1 Oct 83 and 1 April 1985, respectively. Although

the actual text of PL 98-72 is only two and one-half pages long, the law has had a significant impact on the synopsis, solicitation and negotiation of all contracts, particularly noncompetitive or "sole source" actions.

CICA, on the other hand, was monumental both in length and impact. Viewed as the most far-reaching change ever to Government contracting, CICA effectively changes contracting's entire thrust from a formal advertising versus negotiation focus (which had been the law since 1798 when the War and Navy Departments were first authorized to make purchases) to a fully-open, competitive versus non-competitive focus. (5; 33)

These two pieces of legislation form the collective basis of what the researcher refers to hereafter as recent Competition Related Legislation (CRL).

General Issue

Every program and policy which is enacted, however, costs something to implement, either in terms of additional resources or opportunity costs. Within the past ten years, it has become evident that new legislation has added to the complexity of contracting procedures by levying additional requirements on buyers and contracting officers (38:ii-iii). The perceived philosophy behind the recent CRL is that, while it is recognized that there will be additional effort required to insure continued competition, those costs would

be offset by the resulting price reductions accrued through allowing competitive forces to drive prices lower (5; 24).

Certainly, we can point to many of the success stories in which the Government has enjoyed considerable savings through competing the procurement of equipment, goods and services. In his first legislatively required report to Congress in December of 1985, Brigadier General Gerald Schwankl, then the Competition Advocate General for the Air Force, highlighted increases in competitive awards during fiscal year 1985 amounting to almost $3 billion more than in fiscal year 1984. A few excerpts from General Schwankl's report are as follows:

> A T-56 engine combustion liner procurement was competitively awarded in November 1984. The sole source unit price was $1,150. The competitive unit price was $863, achieving a cost avoidance of $638,000 (30:6).
>
> An F100 engine eleventh stage compressor ring assembly procurement was competitively awarded in December 1984. The sole source unit price was $1,858. The competitive unit price was $1,270 with a total contract cost avoidance of $328,000 (30:6).
>
> A sole source aircraft duct assembly was reviewed and a new target unit price of $299 established. The sole source unit price had been $1,379. A data package was completed and a competitive price of $289 was obtained with a total contract cost avoidance of $119,000 (30:6).
>
> The initial government estimate for 10 complementary expendable launch vehicles was $2.5 billion. As the result of competition, the Air Force reduced the estimate by $440 million (30:6).
>
> The competition advocate's office at one of the air logistics centers recommended approval of another source in addition to the original equipment manufacturer. A subsequent award for 232 diffuser

cases was competitive. The unit cost decreased from $71,000 to $51,000. The total contract cost avoidance was $4.6 million (30:6-7).

A TF-33 engine vane procurement was competitively awarded for a quantity of 21,342. The sole source unit price was reduced from $220 to $135. The resulting cost avoidance was $1.8 million (30:7).

After correcting reprocurement data deficiencies, it was determined that an A-10 aircraft access door could be competitively procured. The unit cost was reduced from $1,902 to $306 for a total cost avoidance of $570,000. A similar situation on another A-10 aircraft door resulted in a $772,000 cost avoidance (30:7).

It is unfortunate that these success stories must be stated primarily in terms of "cost avoidance" rather than in actual accrued savings. Although the Air Force can honestly show dramatic cost avoidances which are directly attributable to competition efforts, the increased requirements for resources needed to accomplish these competitive actions (2) are not funded from cost avoidance coffers, since none exist. Equally unfortunate is that a review of the legislative histories which detail the considerations surrounding recent CRL (34; 35; 36) do not reflect any Congressional analysis of their potential impact on the workforce, but focus only on cost savings to the Government. The grim reality is that the contracting manpower to continue competing more actions must come out of our own "hides". This additional contracting manpower is above and beyond those personnel who must continue to staff the Competition Advocate Program. Currently, there are 85 positions authorized within Air Force Systems Command (AFSC)

alone whose main purpose is to promote, enhance and sustain competitive procurement (30:5).

High-level acquisition officials within DOD have begun to recognize that the dogged emphasis on complying with the letter of the law may force us to seek too much of a good thing and negate some of the gains resulting from CRL. As an example, Brigadier General John Slinkard, DCS for Contracting within AFSC, points out that additional approval procedures of the recent competition-related legislation may increase "the potential for spending more to buy than the item being bought is worth" (31). General Slinkard also notes that his command, AFSC,

> used 60,000 hours of paid overtime and a lot of unpaid overtime in FY84 to keep leadtime from increasing significantly...with additional [legislative] impacts in FY85, leadtime in AFSC is growing. A bigger concern is that our number of contracting actions is down 15 percent from the first six months of FY84 to FY85...this could have a significant impact on leadtime downstream (31).

As recently as 1980, Jacques Gansler observed "most defense-contract money is awarded on a sole-source basis, and less than 8 percent is awarded solely on the basis of price competition" (17:2). Assuming this information was valid at the time, it is evident that there is ample room to compete more and more actions in future years. Since it is generally accepted in the Air Force systems acquisition arena that competitively awarded contracts are more labor intensive than non-competitive due to more extensive Requests for Proposals and manhour-intensive source

selection procedures (2), the competitive void created by previous sole source practices cannot necessarily be filled at current manning levels. Most importantly, since the Government contracting community has little discretion given the legal direction mandating competition (versus regulatory guidance in the past), the concern raised by General Slinkard on whether the current number of personnel in the workforce will be able to comply with CRL without degrading productivity or quality seems quite valid.

Statement of the Problem

The two-fold problem, which is critical to Government contracting managers, is as follows:

1. From a resource standpoint, that the changes brought about by CRL are impacting the Air Force systems contracting workload to an unknown degree.

2. From a organizational climate standpoint, that the workforce perceives that CRL is impacting the contracting process.

Objectives

The objectives of this research were:

1. To assess and quantify, in terms of payroll and benefit dollars, the manpower impact to the systems contracting process created by Congressional passage of Competition Related Legislation (CRL), Public Laws 98-72 and 98-369, at the five AFSC product divisions.

2. To gather and present the AFSC systems contracting workforce's perceptions on the impacts of the CRL.

Definitions

The following terms are defined in order to clarify the context of certain terms used in the text of this study:

1. Direct Work - Actions taken during duty hours by secretaries, clerks, buyers, contracting officers, group or branch chiefs, and division chiefs who are assigned to a systems buying activity. Such actions are taken in direct support of the contractual document and file items, and include but are not limited to: review of applicable statutes, orders, regulations, directives and policy letters; drafting, typing, reviewing, revising and signing contractual instruments and supporting file documentation; clarifying, briefing and coordinating acquisition strategies, approaches and positions to approving officials, from initial identification of a requirement through signature and distribution of a contractual document.

2. Direct Personnel - Those individuals who perform direct work as their primary function in a contracting or buying activity.

3. Average Grade - The addition of all grade levels (e.g. GM-13) of direct civilian and military contracting personnel assigned to a systems buying activity, divided by the number of direct personnel assigned. All military personnel without "experience", for quantification purposes

only, were equated to the GS-09 level. Company grade officers with experience were equated to the GS-12 level, Majors to the GM-13 level, and Lieutenant Colonels to the GM-14 level. The determination of a military member's experience level was based on the researcher's consultation with managers from each product division who were knowledgeable of the individual's job history.

4. Workload Assessment Model (WAM) - An algorithm developed and refined by Aeronautical Systems Division (ASD), which provides input to the contracting decision makers who must manage a matrixed organization. The model ties factors such as contractual dollar value, instrument type, and complexity to specific milestones and approval levels. These factors are then translated into a standard number of direct manhours which are required for 25 different types of contractual actions (see Appendix A). After inputs are obtained based on research of historical data, recent correspondence output, review of work in progress, interviews with direct personnel and projection of new work within a six month window, the model provides a baseline of required manning.

5. Significant Changes - Those changes in contracting procedures which, on the average, result in the addition or deletion of direct hours in over 50 percent of personal interviews.

Investigative Questions

This research effort answers the following investigative questions:

1. How has CRL altered the specific steps required in awarding new contracts?

a. What specific requirements for awarding competitive contracts has CRL changed?

b. What specific requirements for awarding noncompetitive contracts has CRL changed?

2. How has CRL altered the specific steps required to modify existing contracts?

3. For the changes identified in 1a., 1b. and 2. above, which are significant (either positively or negatively) in terms of their impact on the direct manpower required to comply with them?

4. For significant changes identified in 3. above, how much direct time do they add to or subtract from the contracting personnel's workload?

5. How much additional direct workload, if any, can be attributed solely to a shift toward competitive contracting procedures in compliance with CRL?

6. Taking significant changes identified in 3. above, and the additional direct workload identified in 4. and 5. above, what are the projected changes, if any, in payroll costs based on average grade of contracting personnel?

Scope

This research effort included analysis of AFSC systems buying activities at Armament Division (AD), Eglin AFB FL; Aeronautical Systems Division (ASD), Wright-Patterson AFB OH; Ballistic Missile Office (BMO), Norton AFB CA; Electronic Systems Division (ESD), Hanscom AFB MA; and Space Division (SD), Los Angeles AFS CA. The research encompassed only those direct civilian and military contracting individuals. Because the manning levels at other types of contracting activities (e.g. Base Level, Central) are determined primarily by manning standards developed and maintained by management engineering staffs (15; 27), and due to the extensive manyears required to conduct a study of such organizations, the researcher chose to limit this effort to the systems contracting environment.

Within systems contracting, the researcher elected to omit research and development activities from study because the Workload Assessment Model, defined above and detailed below, is not structured to accurately assess the somewhat unique contracting procedures which are characteristic of basic research and exploratory development projects (23). Certainly, the Model could be adapted for research and development use, but such adaptation is outside the purview of this study.

Finally, this effort does not address the actual payroll costs associated with the 85 competition advocate

positions which were created as a result of CRL (30:5). The researcher considers these resources to be a sunk cost of implementing and institutionalizing the AFSC Competition Advocate Program. Should the Competition Advocate Program in general be changed or abandoned, the legislative requirements of CRL, which buyers and contracting officers must carry out, will still exist; therefore, the study concentrates on direct requirements.

Assumptions

This research effort was conducted under the following assumptions:

1. The steps required to process contractual actions are definable.

2. The processing steps required within each specialized area of contracting follow a similar pattern from year to year (e.g. a major systems contract modification for $50 million) in the absence of systemic changes such as new legislation.

3. Increased or decreased dollars available for obligation within any fiscal year may change the number of actions, but the relative mix or proportion of action types (e.g. new contracts vs. modifications) stays relatively constant within AFSC systems buying activities from year to year.

4. The Workload Assessment Model, based on direct workload and currently in active use at Aeronautical Systems

Division and Armament Division, is a valid predictor of a systems contracting activity's manpower requirements.

Review of the Literature

Because the majority of the requirements of CRL have only been in effect since 1 April 1985, it was extremely difficult to find any completed research on the manpower impacts of the legislation. What follows is a brief review of two studies and one research paper. The researcher believes this literature reflects an adequate general knowledge base from which to conduct this effort.

The Impact of Legislation on Workload. Young, et al (38), researched the growing imbalance of workload versus the workforce in their 1981 study. Although economic factors present in the mid-to-late 1970s accounted for some of the increased complexity and additional time required to accomplish contractual actions, they found "legislative and administrative actions have [served to make] the procurement task more complex, demanding and time consuming" (38:3-1).

The impact of the growing imbalance between workload and workforce, according to the study, is a degradation in the performance of the procurement function. Such a degradation can actually increase costs to the Government because of a higher number of unpriced actions, higher pipeline costs (the costs of holding inventory), and inexperienced negotiators who may fail to get the best

possible price (38:3-1). Their study, however, did not attempt to estimate any of these increased costs.

The Impact of CICA on Lead Time. Majors Hedges and Mason (19) studied the lead time impacts of CICA, which they converted to dollars in terms of increased pipeline costs, on the contracting process within Air Force Logistics Command (AFLC). In their report, they noted that

> several events caused a significant leadtime increase, the majority of which focused on increasing competition in the acquisition process. By comparing the procedural changes of P.L. 98-369 [CICA] to past changes, the predicted CALT [Contract Administrative Lead Time] impact was determined to be an increase of approximately six days (19:vii).

Based on AFLC's estimated pipeline costs of $6.9 million per day, the report projected a $41 million increase from CICA alone. Again, their study did not attempt to estimate any of the direct manpower costs associated with the new legislation.

The Workload Assessment Model (WAM). Goebel, et al (18), reviewed the history and application of the ASD WAM in their research paper presented at the 1983 Federal Acquisition Research Symposium. This is the only known formal description of the model (23), which was developed partially in response to the increasing complexity of the acquisition process, as noted by Young, et al (38).

Prior to the development of the WAM in 1978, ASD contracting manpower requirements were determined through the use of standard time-and-motion studies, conducted by

management engineering activities (18:83; 28; 29). The increasing complexity of the contracting environment evident at that time, coupled with the lack of functional expertise in the management analysts, led ASD to develop the WAM (18:83; 21; 29). Starting with written surveys in 1978 to establish the reported, average, direct time necessary to accomplish tasks associated with varying dollar value contracts, the WAM was refined over the following five years. Since its last revision in 1983, the WAM process has been a valid indicator of required manning, and plays an integral part in the decision making process regarding matrix management at ASD and AD (16; 23). The current WAM, however, still reflects the state of nature which existed before the CRL took effect.

The researcher was a member of the ASD Contracting and Manufacturing staff from October 1983 until May 1985. During that time period, he participated in five workload assessments of matrixed contracting organizations, thus gaining an intimate knowledge of the WAM, its strengths and weaknesses. Given this experience and knowledge, along with three years of previous buying experience, the researcher determined that the ASD WAM, in its current form, could be used as a baseline from which to judge the impacts of the CRL on the AFSC systems buying workforce.

II. Methodology

Chapter Overview

This chapter describes the approaches used in accomplishing the research objectives and answering the investigative questions raised in Chapter I. The chapter also describes the sample population from which data were collected, the methods of data collection, and the techniques used in analyzing the data. Finally, the limitations of this research effort are presented.

Approaches for Answering the Investigative Questions

The data required for answering the investigative questions raised in Chapter I were scattered among many different types of sources. For the purposes of simplification, the researcher has divided the data required to answer the investigative questions into three general categories: Legislative/Regulatory Data, Manhour Data, and Historical Data. The following sections discuss the procedures used for the collection of these data.

Legislative/Regulatory Data. Investigative questions 1a., 1b., and 2 relate to the identification of changes which were made to federal laws and, subsequently, to the regulations which govern the acquisition of equipment, goods

and services by AFSC. After reviewing the contents of the U.S. Code, legislative histories of the CRL, and the governing acquisition regulations which existed as of the effective dates of the CRL (i.e. Defense Acquisition Regulation or DAR, Federal Acquisition Regulation or FAR, as supplemented and amended), the researcher was able to establish a baseline of specific requirements, relating to award of contracts and modifications, which impacted direct personnel at that time. This baseline correlates directly to the WAM, as Chapter I noted, since the current WAM reflects the state of nature which existed prior to CRL implementation.

The researcher then reviewed the text of the CRL and the implementing Acquisition Circulars (i.e. Defense Acquisition Circular, Federal Acquisition Circulars, as supplemented), which effected the changes mandated by law to these governing acquisition regulations. In this manner, the differences in regulatory direction, which affected direct personnel in awarding contracts and issuing modifications, and which could be legitimately attributed to the CRL, were delineated.

Manhour Data. Investigative questions 3 and 4 deal with the significance of the legislative/regulatory changes, which were alluded to above, and explore how those changes might impact the workload of direct systems contracting personnel at AFSC product divisions. To answer these

questions, the researcher developed a structured interview (see Appendix B), which covered those procedures affected by the CRL and identified in the legislative/regulatory data collection process described above. A structured interview, conducted in person, was determined to be the best way of gathering these data for the following reasons:

1. The interview questions requested information which the subjects could provide only while they reviewed the official file which supported a specific contractual action. The researcher and his advisor agreed that the reliability of the data would be enhanced by the interviewer's presence, rather than conducting the interview by telephone.

2. While the researcher made every effort to identify the significant changes affecting direct personnel prior to commencing the interviews, it was believed that corollary, qualitative data, which was not readily apparent by reviewing the laws and regulations, was likely to be discovered during the interview process. This belief precluded the use of a mailed survey.

3. The interview questions required the subjects to reconstruct events which occurred up to 18 months previously. These are difficult and abstract responses to elicit from a subject; the researcher believed, therefore, that accuracy of any answers would be greatly enhanced by personal contact, rather than collected telephone interviews.

Because the CRL established a Competition Advocate Program, and since the interviews would require the use of records maintained by the Competition Advocate at each product division, a letter of introduction was requested from the AFSC Competition Advocate, Mr Anthony DeLuca (see Appendix C).

Upon arrival at each product division, an informal inbriefing was delivered to the Deputy for Contracting/Contracting and Manufacturing or his designee (see Appendix D). Each product division then provided a point of contact to assist the researcher in his data collection efforts.

The interviews were conducted informally, with the researcher manually noting significant facts and comments made by the subjects. All subjects were advised that their responses would not be directly attributed to them to foster openness and candor. A description of the demographic composition of the interview population from each product division is presented in Chapter III.

Data Collection Plan. The researcher developed his data collection plan based on the logbooks of Justification and Approval documents--requests to process actions employing less than full and open competition--maintained by the local Competition Advocate's office. Interviews were conducted based on a sample of convenience,

but were limited to subjects which met the following criteria:

1. Those physically available for a personal interview. This limitation precluded those individuals who were TDY, on leave, in negotiations, no longer working at that product division, or otherwise unavailable for interview.

2. Those who had personally accomplished the majority of direct work on at least one action which was classified as "other than full and open competition" under the new CRL rules. This limitation was made with the belief that only those individuals who accomplished the direct work could accurately recall the amount of effort which was required.

3. Those who were either still working in the same buying activity since processing these actions, or who were in close enough proximity to accomplish the interview without disrupting their new workplace.

The sample population is summarized in Table 2.1.

While conducting interviews at the product divisions, the researcher was able to obtain, with one exception, the current organizational charts which reflect personnel assigned to each systems buying activity. These data were secured for the calculation of average grades for conversion of manhours to payroll dollars. This calculation was used in answering investigative question 6. The noted exception was at ESD/PK, which was undergoing an extensive

Table 2.1

Summary of Sample Population

Product Division	Total Individuals Interviewed	Total Actions Investigated	Total Actions Processed*	Percentage of Total Actions Investigated
AD	12	15	34	44
ASD	26	28	64	44
BMO	8	13	31	42
ESD	11	15	29**	52
SD	14	15	22***	68
Total	71	86	180	48

* Total includes only systems contracting actions
** Does not include Rome Air Development Center
*** Does not include AF Satellite Control Facility, Western or Eastern Space and Missile Centers

reorganization and was unable to provide any current organizational charts. In lieu of these data, the researcher accepted information on the numbers and grades of civilian and military individuals assigned to the buying offices, and derived the average grade calculation for ESD direct personnel from those figures.

Historical Data. Investigative question 5 addresses the analysis of the workload impact created by any increases in competitive actions, over and above that which would have been expected, given historical trends. In answering this question, the researcher was required to gain access to the AFSC data base known as the Acquisition Management Information System, or AMIS.

There are several files or "drawers" within the AMIS data base (20; 37). For the purpose of detecting any unusual shifts in competitive actions which may, according to the WAM, impact workload, the researcher determined that the DD Form 350, Individual Contracting Action Report data base, would provide the most reliable data available. The DD Form 350 is a compilation of information surrounding specific contracting actions over $25,000. Included are dollar amount, extent of competition, and contract type. This information is consolidated by each of the services and the total is reported to Congress. The researcher received historical data on competitive new contract starts for AFSC systems buying activities, extending back to 1 April 1980.

The historical data were obtained with the same "rules" used in queries that supply competitive/follow-on/sole source reports, which are subsequently incorporated into the annual "Report to Congress on Competition" (14). The data sorts were accomplished for each systems contracting activity by selecting the activity's "H" code, or organizational identifier, in the search string. A list of H codes used, their corresponding organizations and the language of an example search string are at Appendices E and F.

Selection of Bio Medical Data Package (BMDP) Statistical Software. The BMDP statistical analysis package was used for the linear regression portion of this study. The BMDP computer routines are

> designed to aid data analysis by providing methods ranging from simple data display and description to advanced statistical techniques (13:1).

The major factor in the researcher's selection of this particular software package was his familiarity with its capabilities in the area of regression analysis.

Using simple linear regression of the total annual manhours used by AFSC buying activities in the 10 WAM categories for competitive new contracts (see Appendix A), the researcher was able to project the expected number of manhours required for the award of competitive contracts after the effective date of CRL. By defining regression years as the period from 1 April to 31 March, this expected number could then be compared to the actual number used

after CRL took effect on 1 April 1985. Thus, any changes from the trend established through regression analysis, which was evident in the regression year of 1 April 1985 to 31 March 1986, could be analyzed.

Assumptions of the Simple Linear Regression Model. In selecting simple linear regression as a method of establishing a reliable probabilistic relationship between variables, four assumptions about the random error ϵ must be made and verified (26:408):

1. The mean of the probability distribution of ϵ is zero.

2. The variance of the probability distribution of ϵ is constant for all settings of the independent variable.

3. The probability distribution of ϵ is normal.

4. The errors associated with any two different observations are independent.

Choosing Statistical Tests for Evaluating the Regression. Because the data for regression were annualized, the researcher was limited to regression analysis of five data points in projecting the manhours required for the sixth year. The researcher chose to rely on two statistical measures in evaluating whether the independent variable, regression year, was related to the dependent variable, manhours required for competitive new starts. Those measures were the t statistic and the coefficient of determination, or R^2.

The t statistic reveals the utility of the hypothesized model; that is, whether the independent variable actually contributes information for the projection of the dependent variable in the simple regression model (26:440). The general hypothesis for the t test, which verifies a linear relationship between variables, is:

$$H_o: \beta_1 = 0$$

$$H_a: \beta_1 \neq 0$$

where

β_1= The slope of the regression line

The significance level of the statistical test, denoted by α, for this research effort was selected as .05, which is a generally accepted level for research of this nature. At this α, H_o would be rejected given a t statistic with a value of greater than $t_{\alpha/2}$ (or less than $-t_{\alpha/2}$), which equals 3.182 at n-2 degrees of freedom, where n equals the number of data points (26:413). In this analysis, the number of data points is 5, resulting in 3 degrees of freedom. The critical value of t at 3 degrees of freedom can be determined from a standard t-table found in intermediate statistics texts. Therefore, given a t statistic greater than 3.182 (or less than -3.182), we could infer that the value of β_1 is not zero, thus suggesting there is a linear relationship between manhours required and the regression year.

The coefficient of determination, or R^2, reveals the degree to which the errors of predicting the dependent variable were reduced by introducing the independent variable (26:421). While there is no specific hypothesis for the acceptance or rejection of this measure, its numeric value will provide insight into the model's explanatory strength.

Forecasting Models as Alternate Measures. Since only five data points were used for the regression analysis, the researcher employed the use of two forecasting techniques as an alternate measure of the expected number of manhours spent on competition. These techniques were a five-period weighted moving average and the exponential smoothing model.

The weighted moving average allows the user to assign different importance or "weight" to historical data points in order to project requirements in the next time period. Although this model is commonly used in production settings, the researcher believed it would provide a viable alternative method of verifying the regression results due to its time-dependent nature. (12:461)

Exponential smoothing is a further refinement of the weighted moving average, which

> permits discounting the effect of old data and reduces the requirements for data storage to a minimum (12:461).

The formula for the exponential smoothing model which was used for this effort is shown below (12:462):

$$Y'_{t+1} = \alpha Y_t + (1 - \alpha)(Y_t') \qquad (1)$$

where

Y_t = actual demand for current period
Y_t' = forecast for current period
Y'_{t+1} = forecast for the next period
α = preselected smoothing constant

Limitations of the Study

The study was restricted by several factors over which the researcher had little control. The following information should be considered when reviewing the study results and analysis:

1. The nature of systems contracting is inherently complex. In 1981, Young, et al, noted over 300 possible Defense Acquisition Regulation (DAR) requirements for processing and awarding contracts (38:1-4). Moreover, a buyer or contracting officer may have several actions in process simultaneously, and a requirement (e.g., a Justification and Approval) is rarely accomplished from start to finish without completing other, less time consuming actions. In recognition of these facts, the researcher could only request estimates of the time spent on new CRL related requirements in "ball park" terms.

2. The limited amount of time available to conceptualize, plan, coordinate, conduct and report the

study made it impossible to encompass any activities outside the AFSC systems buying arena. In some other types of contracting activities, processing times and manning levels are determined strictly from a straight line formula (e.g. base level supplies) developed by management engineering analysts. According to the base level supplies manning standard, personnel have roughly 25 minutes to solicit and award a purchase order (10:1). One can readily see that an impact of even 30 minutes per purchase order could be devastating to manpower requirements in that scenario. The current base level manning standards were last updated in 1979 (27).

3. Because of the lengthy nature of the acquisition cycle in systems development and production, and because the CRL has been in effect a relatively short period of time, the study may not reveal problems which are on the horizon. This effort should be viewed as a first look at a problem which must be reevaluated every few years.

4. The abbreviated source selection procedures used at BMO made it necessary to adjust their data for use in the regression. Following discussions with source selection personnel at BMO, the researcher combined all source selections conducted at BMO, in WAM categories 5 through 10, into WAM category 4 for calculation of competitive manhours. This adjustment was made in recognition of BMO's lower

estimation of the manhours spent in source selection under their streamlined procedures. (22)

5. Changes in contract administrative lead time (CALT) trends which have resulted from CRL could not be addressed due to the absence of standard and reliable CALT data (3).

6. Due to the limited amount of data collection time available, the researcher did not determine the additional time required to comply with synopsis requirements for all actions, but focused only on times required to synopsize actions for which Justification and Approvals were processed.

III. Findings and Analysis

Chapter Overview

This chapter presents and analyzes the legislative/regulatory, manhour and historical data collected during this study. Results of interviews conducted at the five AFSC product divisions, perceptions of the workforce, along with the findings of the regression and forecasting analyses, are given. Finally, the changes in manhours which were found are converted to payroll and benefit dollars.

Legislative/Regulatory Changes

This section analyzes the changes which CRL made to applicable laws and acquisition regulations as they existed before the effective dates of each piece of legislation. It also provides answers to Investigative Questions 1 and 2 which were raised in Chapter I.

Public Law 98-72, Commerce Business Daily. Effective date: 1 October, 1983.

Synopsis. Public law 87-305, Amending the Small Business Act, empowered the Secretary of Commerce to "obtain and publish notice of all proposed defense procurement actions in excess of $10,000" (34:712). Such publication

was and is made, by the involved agency, in the Commerce Business Daily or CBD, which provides U.S. businesses with information on contemplated government contracts.

The Defense Department's implementation of Public Law 87-305, as well as all other laws affecting the acquisition process, was accomplished through the Defense Acquisition Regulation, or DAR. The regulation stated:

> To allow concerns which are not on current bidders lists ample time to prepare bids, proposals or quotations, purchasing offices should, when feasible, synopsize proposed procurements no later than ten days before the issuance of solicitations (6:1:168).

The operative phrase which caused Congressional concern with the DoD implementation was "...purchasing offices should, when feasible, synopsize...". This effectively created a discretionary loophole, under which purchasing offices could legally not synopsize proposed actions. The following excerpts from the legislation's history summarize the Congressional views on this point:

> Each procuring agency is responsible for complying with the regulations in their entirety. Yet, during several Committee hearings in 1982, witnesses (from the Federal Agencies and the small business community) repeatedly noted that the regulations are only partially complied with, or at times, are totally ignored, by procuring agencies. Several small business owners who regularly use the Commerce Business Daily informed the Committee that, all too often, synopses appear too late to permit an interested company to prepare and submit a timely bid or proposal. They added that this problem is compounded when synopses contain inadequate information, or are "misfiled" in the Commerce Business Daily (35:713).
>
> Another common complaint centered around agency abuse of exemptions from required advertising in the Commerce Business Daily. Several small business witnesses

> testified that they believed many more procurements should be advertised under the provisions of the law than actually appear. These witnesses also expressed the view that many more procurements would be advertised if agencies followed the existing law (35:714).
>
> The Administrator of the Office of Federal Procurement Policy (OFPP) admitted that enforcement of the Commerce Business Daily regulations was indeed difficult. Yet, he advocated administratively strengthening the existing regulations as the best method for improving the "timeliness" problems described by the small business witnesses (35:714).
>
> Testimony received during the hearings on [Senate Bill] S.1947 revealed that some federal procuring agencies interpret the existing law to apply to only formally advertised procurements (35:715).
>
> Unlike the Administration, this Committee views further regulatory requirements as ineffective unless they are backed by statute (35:714).

It is clear from these excerpts that Congress wanted to close the discretionary loophole discussed above. Additionally, Congress desired to see the broadest dissemination of information related to contemplated contracting actions as a specific service to the small business community, and to defense contractors in general.

Public Law 98-72 did in fact change the wording of Public Law 87-305 to prohibit the issuance of a solicitation for a new contract, or a new work modification, until fifteen days after synopsis. Additionally, this amending law required at least a 30 day response period for all such solicitations, and strengthened its language by specifying that "all proposed competitive and noncompetitive actions be

synopsized" (32:403). DAR was amended accordingly (6:1:167-186).

Sole Source Contracting Actions. Prior to the passage of this law, approval of sole source actions was a local determination. Although procuring offices varied in their specific approval policies as the action's dollar value crossed certain thresholds, approval of all sole source actions was a matter handled internally by each product division within AFSC. As an example, ASD's supplement to DAR specified either that the Director of Contracting, Program Office Director, Deputy for Contracting and Manufacturing, or the ASD Commander or Vice-Commander would approve sole source actions under varying circumstances (1:3-1). There was no policy in DAR, or the Air Force supplement thereto, which required the product division to obtain higher approval for sole source actions.

Unlike the synopsis requirements reviewed above, the law's provision for sole source approval by the head of the procuring activity was not subject to extensive debate in Congress. This requirement was added, by amendment, to the Senate Bill which supported the legislation by Senator Carl Levin. The purpose of this addition was to

> provide greater internal agency review of significant sole source awards to insure that the use of a non-competitive process is in the best interest of the Government (35:721).

Public Law 98-72 required, and DAR was amended to include, that the contracting officer must obtain the non-

delegable approval from the head of the contracting activity for sole source actions over $1 million in fiscal year 1984, $500,000 in fiscal year 1985, and $300,000 in fiscal year 1986 and thereafter (32:404; 7:3:1-A).

Public Law 98-369, The Competition in Contracting Act (CICA). Effective date: 1 April 1985.

Competition Requirements. Within DOD, the Armed Services Procurement Act of 1947 has been the legislative foundation from which regulations and procedures were developed. The law required that, "whenever feasible and practicable", government agencies formally advertise their requirements, solicit sealed bids and award contracts without discussion to the lowest responsive and responsible bidder. (36:2175)

While the law and the implementing regulations, DAR and later the Federal Acquisition Regulation or FAR, established formal advertising as the preferred contracting method, it was often an infeasible or impracticable method to use in weapon system procurement. The law and regulations, in recognition of such circumstances, authorized the negotiation of procurements under 17 exceptions. To control the overuse of negotiation, many of the 17 authorities to negotiate required a written determination, in some cases by the agency head. (36:2175)

The procurement process, as it existed before CICA, did not recognize competitive negotiation as an equally or near-

equally preferred method to the sealed bidding process. Because of weapon system complexity, however, the "less favored" contracting method of negotiation was, and still is by necessity, a way of life within AFSC. (5)

Congress, after being jolted by the spare parts and support equipment horror stories which surfaced in April, 1983, began to closely scrutinize the DOD procurement process. The following excerpts from the legislation's history summarize Congressional views regarding competition:

> Competitive procurement, whether formally advertised or negotiated, is beneficial to the government. First, competition in contracting saves money (36:2175).
>
> In addition to potential cost savings, competition also curbs cost growth (36:2176).
>
> Competition may also promote significant innovation and technical changes (36:2176).
>
> A long-term benefit of competition, moreover, is enhanced mobilization capability and industry responsiveness (36:2176).
>
> The last, and possibly the most important, benefit of competition is its inherent appeal of "fair play". Competition maintains the integrity in the expenditure of public funds by ensuring that government contracts are awarded on the basis of merit rather than favoritism (36:2176).
>
> Despite the significant benefits of competition in contracting, the Committee has found that most federal contracts - by dollar value - are awarded without competition. In fiscal year 1982, more than half the value of all federal contracts was awarded noncompetitively. Even more disturbing is the fact that competitive contracting has declined in recent years and continues to decline this year according to the General Accounting Office (GAO) and data compiled by the Federal Procurement Data Center (FPDC) (36:2176).

> When competitive negotiation is appropriate, moreover, agencies are required to indulge in what the Commission regarded as "expensive, wasteful and time consuming" procedures to justify its use (36:2183).
>
> Restrictions are needed, however, to control the use of noncompetitively negotiated contracts. Of the $146.9 billion in contracts (over $10,000) awarded in fiscal year 1982, approximately 54 percent were negotiated noncompetitively. The defense Department sole-sourced 54.3 percent of its contracts...therefore, a second, and more severe, shortcoming of the present statutes is the absence of any direct restriction on sole-source contracting (36:2183-2184).

Congress clearly recognized the existent flaws in the procurement process which had been debated and partially dealt with under Public Law 98-72. Evidence of the intertwinement between Public Law 98-72 and Public Law 98-369 can be found in their legislative histories, where the issues of synopsis and sole source procurement are discussed in detail.

Although the two laws are interrelated, Public Law 98-369 served to change the entire focus of government contracting from the formal advertising versus negotiation dichotomy to giving absolute preference to full and open competition over less fully competitive situations. The law removed the 17 exceptions to formal advertising, and placed competitive negotiation on near-equal preference with "sealed bidding", which is the revised term for formal advertising. Additionally, the law required the processing of a Justification and Approval (J&A) for use of other than full and open competitive procedures (33:98 STAT 1189). FAR was amended accordingly (9:6-1 - 6-7).

Market Survey Requirements. Testimony given to Congress while they explored the facts and issues pertaining to the law revealed that procuring agencies did not conduct adequate market research in preparing for acquisitions. Again, excerpts from the legislative history are presented to summarize Congressional views:

> Competition in contracting depends on the procuring agency's understanding of the marketplace. In addition to advance procurement planning, market research is essential in developing this understanding (36:2186).
>
> Despite the statutory and regulatory requirements, however, Robert Gilroy [Associate Director of the Procurement, Logistics, and Readiness Division, U.S. General Accounting Office] testified at the June 29, 1982, hearing that agencies are guilty of conducting insufficient market research (36:2186).
>
> While the CBD is not the only means of notifying businesses of prospective government contracts, the failure to publish a preaward notice can seriously limit competition because some businesses - particularly small businesses - rely heavily on the CBD to identify contract and subcontract opportunities (36:2187).

The law makes necessary, and FAR implements, the requirement for a market survey by making it a mandatory issue addressed in all acquisition plans. Since a market survey must also be conducted as one basis for justifying sole source actions, it follows that market surveys are now accomplished for every new contracting action.

Table 3.1 below summarizes the significant changes which the legislative/regulatory data collection process revealed affect systems contracting direct personnel. Additionally, this tabularized summary provides answers to

Investigative Questions 1 and 2, which were raised in Chapter I.

Table 3.1

Summary of CRL Changes (1; 6; 7; 8; 9)

Before CRL	After CRL
Synopsis Requirements	
Purchasing offices should, when feasible, synopsize proposed procurements no later than 10 days before issuance of solicitations	Contracting officers shall synopsize new contracts and new work modifications at least 15 days before issuance of a solicitation. Agencies shall allow at least 30 days response time
Market Survey	
Results of market survey required to be addressed in acquisition plans for commercial or commercial-type products	Results of market survey required to be addressed in all acquisition plans
Authority to Negotiate	
Determination and Findings required in most situations	No authority required to conduct full and open competitive negotiations
Sole Source Actions	
Sole Source Justifications approved by Product Division Commander	Justification and Approval:
Sole Source Justification supports Determination and Findings	Up to $1 million reviewed and approved by Product Division Principal Competition Advocate
	Over $1 million to $10 million reviewed and approved by head of contracting activity
	Over $10 million reviewed and approved by agency senior acquisition executive
	Justification and Approval supports acquisition plan

Manhour Changes - Other Than Full and Open Competition

This section presents the results of personal interviews which were conducted to determine if changes brought about by CRL were significant. It discusses how much additional direct time is being spent on these changes. Additionally, this section provides answers to Investigative Questions 3 and 4 which were raised in Chapter I.

The interviews at the five AFSC product divisions were conducted from 19 June 1986 through 7 August 1986. The interview questions were developed based on the changes in procedures summarized in Table 3.1 above. A copy of the interview sheet used can be found at Appendix B.

On the tables which summarize the results of the interviews for each product division, the researcher used the following equation in computing the unknown value of total additional manhours in other than full and open competition:

$$\frac{\text{addtional manhours derived from interviews}}{\text{number of actions in the interview sample}} = \frac{X}{\text{total actions processed requiring J \& As for that organization}} \quad (2)$$

where

X = total additional manhours used in other than full and open competition for that organization

Once the total number of additional manhours used on other than full and open competition was established using the cross multiplication technique, the researcher made the calculation found in eq (3) below. The figure of 1760 manhours per manyear is based on the standard workyear figure used in the Workload Assessment Model (2).

$$\frac{\text{total additional manhours used in other than full and open competition}}{\text{1760 manhours}} = \text{additional manyears used in other than full and open competition} \quad (3)$$

Deputy for Contracting and Manufacturing, Armament Division. Interviews were conducted from 30 June 1986 through 3 July 1986. The interview population consisted of 11 civilian and 1 military individuals, of whom 7 were Contract Negotiators and 5 were Contracting Officers. Information pertaining to 15 separate contracting actions, including 10 new contracts and 5 five new work modifications, was gathered. Table 3.2 below shows the results of the interviews.

Table 3.2

Armament Division Interviews

Additional Manhours Used For:	
Synopses and Evaluation (Market Survey and Notice of Contract Action)	221
Justification and Approval	648
Changes to the Acquisition Plan (as a Result of CRL)	24
Total Additional Manhours Found Through Interviews	893
Total Additional Manhours Used in Other Than Full and Open Competition - Eq (2)	2,024
Total Additional Manyears Used in Other Than Full and Open Competition - Eq (3)	1.15

Deputy for Contracting and Manufacturing, Aeronautical Systems Division. Interviews were conducted from 22 July 1986 through 7 August 1986. The interview population consisted of 20 civilian and 6 military individuals, of whom 19 were Contract Negotiators and 7 were Contracting Officers. Information pertaining to 28 separate contracting actions, including 27 new contracts and one new work modification, was gathered. Table 3.3 below shows the results of the interviews.

Table 3.3

Aeronautical Systems Division Interviews

Additional Manhours Used For:	
Synopses and Evaluation (Market Survey and Notice of Contract Action)	270
Justification and Approval	2,087
Changes to the Acquisition Plan (as a Result of CRL)	4
Total Additional Manhours Found Through Interviews	2,361
Total Additional Manhours Used in Other Than Full and Open Competition - Eq (2)	5,397
Total Additional Manyears Used in Other Than Full and Open Competition - Eq (3)	3.06

Deputy for Contracting, Ballistic Missile Office.

Interviews were conducted from 18 June 1986 through 23 June 1986. The interview population consisted of 8 civilian individuals, of whom 5 were Contract Negotiators and 3 were Contracting Officers. Information pertaining to 13 separate contracting actions, including 11 new contracts and 2 new work modifications, was gathered. Table 3.4 below shows the results of the interviews.

Table 3.4

Ballistic Missile Office Interviews

Additional Manhours Used For:	
Synopses and Evaluation (Market Survey and Notice of Contract Action)	134
Justification and Approval	98
Changes to the Acquisition Plan (as a Result of CRL)	24
Total Additional Manhours Found Through Interviews	256
Total Additional Manhours Used in Other Than Full and Open Competition - Eq (2)	610
Total Additional Manyears Used in Other Than Full and Open Competition - Eq (3)	.35

Deputy for Contracting, Electronic Systems Division.

Interviews were conducted from 7 July 1986 through 10 July 1986. The interview population consisted of 5 civilian and 6 military individuals, of whom 8 were Contract Negotiators and 3 were Contracting Officers. Information pertaining to 15 separate contracting actions, including 9 new contracts and 6 new work modifications, was gathered. Table 3.5 below shows the results of the interviews.

Table 3.5

Electronic Systems Division Interviews

Additional Manhours Used For:	
Synopses and Evaluation (Market Survey and Notice of Contract Action)	189
Justification and Approval	696
Changes to the Acquisition Plan (as a Result of CRL)	61
Total Additional Manhours Found Through Interviews	946
Total Additional Manhours Used in Other Than Full and Open Competition - Eq (2)	1,829
Total Additional Manyears Used in Other Than Full and Open Competition - Eq (3)	1.04

Deputy for Contracting and Manufacturing, Space Division. Interviews were conducted from 24 June 1986 through 27 June 1986. The interview population consisted of 9 civilian and 5 military individuals, of whom 11 were Contract Negotiators and 3 were Contracting Officers. Information pertaining to 15 separate contracting actions, including 11 new contracts and 4 new work modifications, was gathered. Table 3.6 below shows the results of the interviews.

Table 3.6

Space Division Interviews

Additional Manhours Used For:	
Synopses and Evaluation (Market Survey and Notice of Contract Action)	695
Justification and Approval	1,679
Changes to the Acquisition Plan (as a Result of CRL)	72
Total Additional Manhours Found Through Interviews	2,446
Total Additional Manhours Used in Other Than Full and Open Competition - Eq (2)	3,587
Total Additional Manyears Used in Other Than Full and Open Competition - Eq (3)	2.04

Summary and Analysis of the Personal Interviews. The researcher consistently found that the CRL procedures in handling other than full and open competitive actions were creating additional workload for direct personnel, as had been expected. What the researcher did not anticipate was the level to which the seemingly routine synopses were driving time requirements. Additionally, the researcher did not anticipate the wide variance in average processing times which were observed among product divisions. Also, the removal of the requirement for Determination and Findings (D&F) processing was expected to provide an offset to additional hours needed to comply with the new aspects of CRL, but this expectation was found to be erroneous based on the interviews. Finally, the researcher envisioned that the changes in the market survey requirements would adversely affect the preparation of acquisition plans at a significant level, but this expectation was also found to be erroneous.

First, the synopses and evaluation time accounted for nearly 22 percent of the 6,902 additional manhours attributed to CRL and verified by the personal interviews. When the researcher explored the reason for such a large number of manhours, the subjects related that with the emphasis now placed on market survey, the synopsis has evolved into an abbreviated Request for Proposal. The document size of the synopses, which is rarely more than two

double spaced, typewritten pages, is sometimes misleading in relation to the time spent in their preparation.

Next, the researcher had expected to find a variation in the number of hours spent in complying with CRL requirements among product divisions, mainly as a function of volume. However, it was expected that the average processing time would be similar between product divisions. Table 3.7 below shows the average additional processing time, by product division, for verified actions with other than full and open competition:

Table 3.7

Average Manhours to Process CRL Requirements

Product Division	Average Processing Time (In Hours)
AD	60
ASD	84
BMO	20
ESD	63
SD	163

The researcher noted the wide variance among product divisions; however, the detailed explanation for such variance is beyond the scope of this study.

Finally, the researcher found only one individual out of the 71 subjects who thought the omission of the requirement for a D&F saved any time. The interviews revealed that, typically, the Director of Contracts who supported the particular program office designated one focal point for D&Fs, and contracting officers provided input only to that "expert". Additionally, the use of Class D&Fs was quite common. As an example, the Propulsion program office at ASD prepared only one D&F, which covered all engine programs, per year. Any questions on content could be checked by referring to the example D&F in the DAR or FAR appendices. Also, the previous year's D&F was used as a model and was simply "marked up" for revision and submission again the following year. Even if there were a significant amount of time saved through elimination of D&Fs, this saved time was of an overhead, not a direct, contracting personnel.

Workforce Perception of CRL. Almost without exception, the workforce acknowledged CRL as a good idea, and they generally understood the reasoning behind the laws. It was felt that, while there was an initial animosity toward competitive procedures by program managers, positive results such as more firms in the market and lower costs were beginning to be realized from the emphasis on advertising and competition.

Most of the favorable comments about CRL, however, were made as an antecedent to the criticisms of the laws' implementation which are introduced below. First, Table 3.8 presents an overall picture of workforce response to the three key questions on CICA from page two of the interview sheet (see Appendix B).

Table 3.8

Workforce Perception of CICA

Question	Responses	
1. Has CICA had a large impact on the time it takes to do your job?	Yes	73 %
	Impact yes, large no	13 %
	No	14 %
2. Has CICA saved any time?	Yes	5 %
	No	95 %
3. Have you been conducting more source selections as a result of CICA?	Yes	23 %
	No*	77 %

* The selection criterion for these interviews was the subject's involvement in prior processing of other than full and open competitive actions under CICA. While the majority stated they were not conducting more source selections, most felt it was a function of their program(s). Additionally, most perceived other personnel were conducting more source selections.

The following comments are a compilation of the workforce's remarks and thoughts which were revealed in the

unstructured portion of the interviewing process. They are not in any particular order of importance, but have been paraphrased and grouped into general categories for presentation.

1. The J&A itself is viewed as a much more complex and thorough document than its predecessor, the sole source justification. The real time driver of the J&A, however, is not in the drafting of the document itself, but in the coordination and approval process. The average J&A typically has 8 signatures on the cover page, which is referred to as the Justification Review Document or JRD. There is an overwhelming propensity for rewrites and wordsmithing, as the JRD must pass through several additional individuals for coordination before each signature is actually obtained. In many instances, the document had been extensively revised along the way, in some cases six or eight times. Each revision necessitated meetings and phone calls to correct or explain the objectionable portion, and then the coordination cycle was started again.

This situation has created considerable resentment on the part of the individuals who are responsible for processing J&As, and has fostered a general "us versus them" mentality between direct personnel and the staff, where the Competition Advocate is typically found. These coordination and approval problems did not appear to be a function of the

proposed contract's dollar value, or of the experience level of the writer. Each action is being challenged, instead, on its own merits or lack thereof. Gone are the days of marking up the last document which was approved as a basis for a new action, because what is acceptable varies with the circumstances of the procurement.

2. Because noncompetitive procedures may be appropriate in one case and not in another, there is a perceived lack of clear direction and policy regarding mandatory criteria for consideration of noncompetitive actions. Perhaps the relative newness of the procedures accounts for some of this perception. However, such lack of specific guidance again promotes the "us versus them" mentality, in the perception that information which may speed the approval process is being withheld from direct personnel.

3. There is no perceived end to the emphasis on competition. In some past initiatives, the workforce anticipated an upfront fervor in their implementation which would eventually diminish back to the original state. Since this initiative is rooted in law, the workforce has accepted competition as the new standard, with little expectation of regression back to previous practices.

4. Competition seems so institutionalized, in fact, that the perception is we sometimes compete actions which would legitimately warrant noncompetitive procedures. The

JRD process is so intimidating and time consuming that the workforce would sometimes rather go through the competitive motions than defend a bona fide sole source action. Several individuals remarked that we are backing into the fostering of competition by making it extremely difficult to use sole source procedures.

5. The requirement to process documentation in support of contracting actions appears to be unreasonable. For example, the acquisition plan, the J&A, and the contract strategy paper all funnel the same information through different channels. The workforce could not see the benefit in processing redundant documentation.

6. There is a real perception of conflicting goals of the CRL and legislation such as Gramm, Rudman, Hollings (GRH). For example, GRH recently made a civilian hiring freeze necessary within DOD. At the same time, the workforce is tasked with increasing competition. The perception is that many quality individuals are becoming disenchanted with such inconsistencies and are taking their years of experience to jobs in the private sector.

7. With a new emphasis on synopsizing, both in number of actions synopsized and the contents of the synopses, several individuals expressed concern over Essential Elements of Friendly Information considerations. We are required to provide as much information as possible about proposed procurements, even those of a classified nature.

The perception of some personnel was that this new openness could lead to a possible compromise of security when published information about many proposed contracts is pieced together.

8. Several individuals related they could not understand the requirement for a J&A on Foreign Military Sales (FMS) cases. The law does require a J&A to be processed for FMS; however, no one could envision that any acquisition for FMS would ever be disapproved due to competition requirements.

9. The large amounts of time spent on the synopses and J&A coordination and approval do not afford adequate time for direct personnel to prepare for the ensuing sole source negotiation. While we have adequately explained the acquisition's circumstances to the required individuals and obtained their approval, we now must rush through negotiations with a contractor who knows we are constrained by time.

Mannour Changes - Shift to Competitive Actions

This section presents the results of the linear regression analysis conducted on the total annual manhours used by AFSC buying activities in the 10 WAM categories for competitive new contracts. Findings of the forecasting techniques used in verifying the regression are also given. This section also provides an answer to Investigative Question 5 which was raised in Chapter I.

The DD Form 350 data were collected as described in Chapter II. Table 3.9 below summarizes the data obtained for AFSC systems buying offices by WAM category:

Table 3.9

AFSC Competitive Actions by WAM Category

WAM Category	Number of Actions by Regression Year*					
	0	1	2	3	4	5
1	4	4	2	0	0	0
2	10	5	10	16	61	76
3	15	21	21	15	36	54
4**	15	13	14	32	31	42
5	8	13	19	15	19	25
6 & 7***	12	13	25	23	27	36
8	7	3	3	9	5	6
9	1	0	3	0	1	0
10	1	1	0	2	2	3

* Regression years extend from 1 April 198X to 31 March the following year
** WAM Category 4 contains all actions in Categories 4-10 for BMO
*** 6 & 7 were combined because the WAM allows the same hours for both categories

The data presented in Table 3.9 above were then converted into manhours for each of the WAM categories by

multiplying the number of actions by the WAM manhours allowed for that dollar value (see Appendix A). Once a value was obtained for each cell, the manhours were added downward for each regression year to obtain totals for manhours expended on competitive actions during that time period. This figure was then multiplied by an overhead factor of 1.275, which is the mean overhead factor used in the WAM to account for various elements of complexity. Table 3.10 below summarizes the manhour figures which these calculations produced:

Table 3.10

AFSC Manhours Used in Competition

Time Period	Regression Year	Total Manhours
1 Apr 80-31 Mar 81	0	118,856
1 Apr 81-31 Mar 82	1	107,483
1 Apr 82-31 Mar 83	2	172,444
1 Apr 83-31 Mar 84	3	190,001
1 Apr 84-31 Mar 85	4	211,918
1 Apr 85-31 Mar 86	5	274,182

To demonstrate that this dramatic increase in manhours was not due solely to an equally dramatic increase in the sheer number of new contracts, the researcher further investigated the total number of competitive and

noncompetitive new starts for the systems buying activities studied. The findings of this analysis are shown in Table 3.11 below:

Table 3.11

Total AFSC Systems Activities New Contracts

Regression Year	Total Competitive	Total Non-Competitive	Competitive Actions as a % of Total
0	73	237	23.5
1	73	153	32.3
2	97	182	34.8
3	112	210	34.8
4	182	141	56.3
5	242	103	70.1

The information presented in Table 3.11 above shows a relatively stable number of contracting actions, particularly in the last three regression years (322, 323 and 345 respectively). The shift toward competitive actions, as a percentage of total actions, however, is marked based on the information contained in this table.

Linear Regression Analysis. The manhour figures shown in Table 3.10 were regressed using BMDP routine 1R, which provides statistical information and graphics of residuals. Appendix G contains the computer output generated from the regression analysis. The critical t value of 3.182,

established in Chapter II, was exceeded by the regression's t value of 4.690. Therefore, the null hypothesis that $\beta_1 = 0$ was rejected. The coefficient of determination, or R^2 value, was .8800. This indicates that 88 percent of the errors of predicting the dependent variable manhours was reduced by introducing the independent variable year, over simply using $\bar{y}$.

It should be noted that the researcher attempted to accomplish regression analysis with manhours obtained from each product division individually, and using identical methodology as for all of AFSC. Only one organization, BMO, had regression results which were significant given the predetermined critical value of the t statistic. Upon discovering this information, the researcher proceeded only with the overall analysis of AFSC.

A review of the residual plots (see Appendix G), coupled with the very strong R^2 value and F test, indicate the four assumptions of the linear regression model reviewed in Chapter II have not been violated. The resulting equation of the regression model was

$$y = \beta_0 + \beta_1 x + \epsilon \qquad (4)$$

where

y = the dependent variable manhours
x = the independent variable year
β_0 = the intercept of the equation = 79,547.8
β_1 = the slope of the equation = 26,864.2
ϵ = the error term of the equation

Based on the above information, the projected value of 240,760, which the regression gave for expected number of manhours required for competitive actions from 1 April 1985 through 31 March 1986, was determined to be an acceptable projection.

This expected value was 33,422 manhours, or 18.99 manyears less than the 274,182 actually encountered in regression year 5, indicating a marked shift of manhours into the competitive category. Although a small portion of these hours would have been incurred even if the new actions had been noncompetitive, it is impossible to tell exactly what proportion those hours would represent. However, those hours, even if deleted here, would be reflected in increased hours devoted to complying with the CRL requirements for other than full and open competition (see Tables 3.2 through 3.6).

Forecasting Models. The researcher then used the weighted moving average technique with weightings of .1, .1, .2, .3, and .3 on the actual manhours required in regression years 0 through 4, respectively. Additionally, the exponential smoothing technique was also applied using eq (1) from Chapter II. Table 3.12 below shows the results of the application of these techniques:

Table 3.12

Forecasting Model Results

Technique	Forecast Value (in manhours)	Variance from Actuals (in manhours)
Weighted Moving Average	177,698	(96,484)
Exponential Smoothing		
$\alpha = .2$	194,384	(79,798)
$\alpha = .3$	196,576	(77,606)
$\alpha = .4$	198,768	(75,414)
$\alpha = .5$	200,960	(73,222)
$\alpha = .6$	203,151	(71,031)
$\alpha = .7$	205,343	(68,839)
$\alpha = .8$	207,535	(66,647)
$\alpha = .9$	209,726	(64,456)

The information presented in Table 3.12 serves to reinforce the utility of the linear regression model, and provide additional evidence that the expected shift of manhours into the competitive category exists.

Conversion of Manyears to Payroll and Benefit Costs

This section converts the additional manyears required by CRL, which were derived through the interviews and linear regression analysis, to payroll and benefit costs. It provides an answer to Investigative Question 6 raised in Chapter I.

As mentioned in Chapter II, the researcher collected organizational charts from each product division to

calculate the AFSC overall average grade for direct contracting personnel. After obtaining this information, it was determined that the average grade for all direct AFSC systems buying personnel was at the GS 10 level (see Appendix H). This average grade accounts for all direct personnel as defined in Chapter I, and was carried forward for the calculations presented in Table 3.13 below.

The researcher then obtained Accelerated Salary Factors, which are used in management engineering studies, for calculation of payroll and benefit costs of the additional manyears required by CRL (11). These factors include retirement, benefits, leave and holiday compensation. The results of all calculations are included in the information presented in Table 3.13 below:

Table 3.13

Conversion of Additional Manyears Required by CRL to Payroll and Benefit Costs

Additional Manyears Required by CRL Derived from Personal Interviews		
AD (see Table 3.2)	1.15	
ASD (see Table 3.3)	3.06	
BMO (see Table 3.4)	.35	
ESD (see Table 3.5)	1.04	
SD (see Table 3.6)	2.04	
	Subtotal	7.64
Additional Manyears Required by CRL Derived from Regression Analysis*		18.99
Total Manyears Required by CRL		26.63
X Accelerated Pay for Average AFSC Systems Buying Grade (GS10) (see Appendix I)		$39,171
Total Payroll and Benefit Costs of CRL within AFSC Systems Buying Activities		$1,043,123

* The projections derived from the linear regression analysis were chosen for calculating total costs because they represent the most conservative estimate of all the techniques presented. Use of even the next most conservative method, the exponential smoothing model at $\alpha = .9$, would result in an additional 31,034 manhours, increasing the total costs by $690,700.

IV. Summary, Conclusions and Recommendations

Chapter Overview

This chapter concludes the research effort by summarizing the Investigative Questions raised in Chapter I and briefly outlining the methodology used in answering these questions. Next, the researcher presents five general conclusions which can be drawn from the study. Finally, three general recommendations regarding possible management actions to alleviate CRL's impact, along with recommendations for further research, are identified.

Summary of the Research

The focus of this research has been on establishing what changes have resulted from the CRL, and how these changes have impacted the direct buying workforce. The methodology of analysis consisted of the construction of six basic Investigative Questions:

1. How has CRL altered the specific steps required in awarding new contracts?

   a. What specific requirements for awarding competitive contracts has CRL changed?

   b. What specific requirements for awarding noncompetitive contracts has CRL changed?

2. How has CRL altered the specific steps required to modify existing contracts?

3. For the changes identified in 1a., 1b. and 2. above, which are significant (either positively or negatively) in terms of their impact on the direct manpower required to comply with them?

4. For significant changes identified in 3. above, how much direct time do they add to or subtract from the contracting personnel's workload?

5. How much additional direct workload, if any, can be attributed solely to a shift toward competitive contracting procedures in compliance with CRL?

6. Taking significant changes identified in 3. above and the additional direct workload identified in 4. and 5. above, what are the projected changes, if any, in payroll costs based on the average grade of contracting personnel?

In order to determine the answers to these questions, the researcher first reviewed the legislative histories of CRL, the laws themselves, and the implementing regulations to determine what changes were actually made to the contracting process. The researcher then constructed and administered a structured interview at the five AFSC product divisions. Finally, historical data were analyzed to obtain the variance between estimated and actual competitive contracting actions in assessing additional workload created by CRL.

General Conclusions from the Research

Based on the information obtained during the regulatory/legislative, manhour and historical data collection process, the following conclusions can be drawn concerning the impacts of CRL on the direct systems buying workforce within AFSC.

Conclusion No. 1. CRL has had a significant impact on the direct systems buying workforce. The impact is readily apparent within AFSC, and has totaled over $1 million in additional payroll and benefit costs alone since it took full effect on 1 April 1985. Given that the requirements for synopsis and competition are rooted in law, the perception of the workforce that CRL changes are permanent is valid. Additional direct costs such as payroll and benefits can be anticipated in the future.

Conclusion No. 2. The J&A, synopses and market survey requirements are the main time drivers in the increased manhours needed to comply with the other than full and open competitive requirements of CRL. For those individuals interviewed, over 97 percent of the additional time they reported spending on requirements of CRL were related to J&A and synopses/market surveys. Much of this time was devoted to coordination and rewrites of the J&A and synopses.

Local interpretation of CRL intent and requirements, along with the unique acquisition environment in which each product division is situated, was responsible for a great

deal of the variance in the average processing times of J&As and synopses throughout AFSC. It should be noted that some areas of acquisition, which have typically been the most heavily concentrated with sole source contracts, may legitimately require more manhours to foster competition than do others. As an example, Space Division (SD) recently received the AFSC Award for Organizational Excellence in Support of Competition (25). Among other accomplishments, SD increased their competitive obligations by 131 percent in just three years (4). Such commitment to increasing competition is indeed noteworthy, and could account for the number of hours spent in the processing of other than full and open competitive actions (see Table 3.7).

Conclusion No. 3. The increased emphasis on competition has driven, and will continue to drive, actions into the manhour-intensive source selection arena. Again, institutionalization of competition in the acquisition process, coupled with the legal requirements of CRL, will not allow for many lost opportunities to compete. Therefore, the commitment of additional resources to staff source selection activities, given current procedures, can be expected.

Conclusion No. 4. The clear mandate for competition is inherently good, and yet potentially dangerous, in that it could lead us to compete in blind adherence to the law, rather than allowing for the rational approach of using

competition where it makes good business sense. If we abandon good business sense in our implementation of CRL, we may be recreating the situation which initially prompted the legislation.

Conclusion No. 5. In theory, there is a continuum of competition with extreme points of full and open competition and sole source. CICA requires the Justification and Approval of all situations which fall outside of the full and open competitive extreme. While many cases could arise where other than full and open competition embraces restricted competition, the interviews revealed that nearly all systems procurements in AFSC fall at either end of the spectrum. The researcher noted only two cases of other than full and open competition which were not sole source in the classic sense. Both instances were for the exclusion of a qualified source in an attempt to foster future competition, and both were sole source after that exclusion.

Recommendations

The following recommendations, based on the findings of this research effort, and the conclusions which can be drawn from those findings, are offered for consideration to deal with the impacts of CRL:

Recommendation No. 1. In recognition of the fact that CRL is a permanent part of the acquisition process, clear and frequent local interpretation and restatement of competition related policy must continue to be communicated

to the individuals who carry out such policy. Much of the resentment which was evident in the direct workforce revolved around the writing and rewriting of documentation. The researcher believes that strong direction, given with the intent of reducing confusion and, in turn, processing times, yet tailored to the unique acquisition environment of that organization, will help alleviate the problem.

The actual hands-on time spent completing upfront requirements like the J&A and synopses is not the only aspect of this problem. The negative reaction of the workforce regarding CRL requirements could undermine the potential benefits to be derived from competition. The researcher strongly believes that the workforce understands and supports the concepts of CRL. Given the clear articulation of the agenda to be followed, the current resentment could well turn to staunch support.

Recommendation No. 2. Review and approval procedures must be reviewed at the agency level to insure we are not requiring more than is mandated by CRL. As an example, CICA requires that the J&A conform to a certain format, address specific information, and be certified by the contracting officer and technical personnel. Additionally, the law requires that approval be obtained from higher levels as dollar value increases. The researcher could find no requirement, with a legal basis, for J&As to be approved by

other individuals, yet the agency has added legal review and the Small Business office to the list of coordination stops.

We must comply with the law. A review of our current procedures should be made, however, with a focus on removing those which exceed the law's requirements. Thus, we could take a first step in reducing the processing times for CRL requirements in the areas which are within our direct control.

In the areas which are not within our direct control, steps should be taken through the proper channels to correct deficiencies. As an example, the requirement to process J&As on FMS directed source acquisitions serves no apparent purpose. Action should be taken to amend the laws to designate FMS as a valid exception to full and open competition which does not require a J&A, much like some exceptions to formal advertising which did not require a D&F.

Recommendation No. 3. The number of competitive actions appeared to be increasing annually. While the potential to compete is limited by the total number of actions processed, competition levels could well remain at 70 to 80 percent of total new contracts.

In light of this fact, source selection procedures should be reviewed for possible streamlining, as was evident at BMO. If the complexity of systems or other factors would not allow for a reduction in evaluation manhours, then

additional manning levels must be requested in the next Program Objective Memorandum submission to accommodate the sustenance of the additional expected workload.

Areas for Future Study

The researcher has identified several areas which future studies should explore:

1. The impact of CRL is undoubtedly felt by direct personnel in other areas of acquisition. Future efforts should research the impact of CRL on other buying organizations within the Air Force, but outside the systems arena, along with the other federal agencies which it affected. Also, the impact of CRL on noncontracting personnel, particularly program managers, should be addressed.

2. There is a potential impact for CRL on contract administration organizations, including more preaward surveys, increased terminations and more first article test failures. Future efforts should attempt to assess the indirect impacts of CRL on these activities.

3. Additionally, research is required with a focus on recent developments, like CRL, and their impact on workforce morale, retention and turnover.

Final Thoughts

The researcher believes, based on this study, that the philosophies behind the CRL are fundamentally sound. Now that the legislation has been in place for over a year, we must take a step back and assess our course.

This research has shown that additional resources are being consumed as a result of the legislation. We cannot reasonably expect personnel to continue doing more with less. It is now incumbent upon management in government acquisition to fine tune procedures where possible, and to recognize the requirements for additional resources where needed.

WAM CATEGORY	SOLE SOURCE HOURS	COMPETITIVE HOURS
01 - NEW CONTRACT ($0-$25K)	55	55
02 - NEW CONTRACT ($25K-$100K)	125	125
03 - NEW CONTRACT ($100K-$500K)	150	250
04 - NEW CONTRACT ($500K-$1M)	245	335
05 - NEW CONTRACT ($1M-$3.5M)	375	1725
06 - NEW CONTRACT ($3.5M-$10M)	450	2600
07 - NEW CONTRACT ($10M-$25M)	520	2600
08 - NEW CONTRACT ($25M-$100M)	575	3875
09 - NEW CONTRACT ($100M-$200M)	635	4850
10 - NEW CONTRACT (OVER $200M)	800	6000
11 - CHANGE ORDER (UNDEFINITIZED)	35	
12 - ADMINISTRATIVE CHANGE ORDERS, FUNDING ACTIONS	20	

WAM CATEGORY (CONTINUED)	SOLE SOURCE HOURS	COMPETITIVE HOURS
13 - PROVISION ITEM ORDER (BILATERAL)	190	
14 - PROVISION ITEM ORDER (UNILATERAL)	45	
15 - UNPRICED BOA ORDER	55	
16 - PRICED BOA ORDER	150	
17 - DELIVERY/PURCHASE ORDER	55	
18 - SUPPLEMENTAL AGREEMENT ($0-$25K)	55	
19 - SUPPLEMENTAL AGREEMENT ($25K-$100K)	75	
20 - SUPPLEMENTAL AGREEMENT ($100K-$500K)	150	
21 - SUPPLEMENTAL AGREEMENT ($500K-$1M)	195	
22 - SUPPLEMENTAL AGREEMENT ($1M-$3.5M)	250	
23 - SUPPLEMENTAL AGREEMENT ($3.5M-$25M)	285	
24 - SUPPLEMENTAL AGREEMENT ($25M-$100M)	310	
25 - SUPPLEMENTAL AGREEMENT (OVER $100M)	350	

Appendix B: Interview Sheet

INTERVIEW SHEET

PROGRAM
CONTRACT#
AWARD AMOUNT
BASIC $_____

OPTIONS $_____

PCO NAME
BUYER NAME
AUTOVON EXTENSION:

TYPE ACTION:

SOLE SOURCE
NEW START
FOLLOW ON AFTER COMPETITION
NEW WORK MODIFICATION

OTHER THAN FULL AND OPEN
SOURCE SELECTION
AFR 70-15
AFSCR 80-15
OTHER
SSA
J & A EXCEPTION ____

REMARKS: _____

_____

_____

_____

DELTA MILESTONES:

	COMPLETION DATE	BUYER	PCO	GROUP LEADER DIVISION CHIEF
MARKET SURVEY/REPORT				
NOTICE OF CONTRACT ACTION				
EVALUATION OF SYNOPSES				
J & A				
ACQUISITION PLAN (DELTA FROM PRE-CICA)				
PREPARE/RELEASE RFP (DELTA FROM PRE-CICA)				

1. WHAT OTHER MAJOR TIME DRIVERS RELATED TO CRL CHANGES, IF ANY, DID YOU FIND WHICH WERE PECULIAR TO THIS ACQUISITION?

2. WHAT RECURRING STEPS DO YOU THINK AFFECT THE PROCESSING OF CONTRACTS UNDER CICA?

3. DO YOU BELIEVE CICA HAS HAD A LARGE IMPACT ON THE TIME IT TAKES TO DO YOUR JOB? HAS IT SAVED ANY TIME? IF YES, IN WHAT WAYS? IF NO, WHY NOT?

4. BESIDES IMPACTING THE "HANDS-ON" TIME SPENT BY BUYERS AND PCOs, DO YOU BELIEVE THERE ARE OTHER WAYS CICA HAS IMPACTED LEADTIME?

5. HAVE YOU BEEN CONDUCTING MORE FORMAL OR MODIFIED SOURCE SELECTIONS AS A RESULT OF CICA?

REMARKS

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR FORCE SYSTEMS COMMAND
ANDREWS AIR FORCE BASE, DC 20334

Appendix C: Letter of Introduction

13 JUN 1986

REPLY TO ATTN OF: CR

SUBJECT: Researching the Impact of the Competition in Contracting Act

TO: AD/PM ASD/PM BMO/PM ESD/PK SD/PM

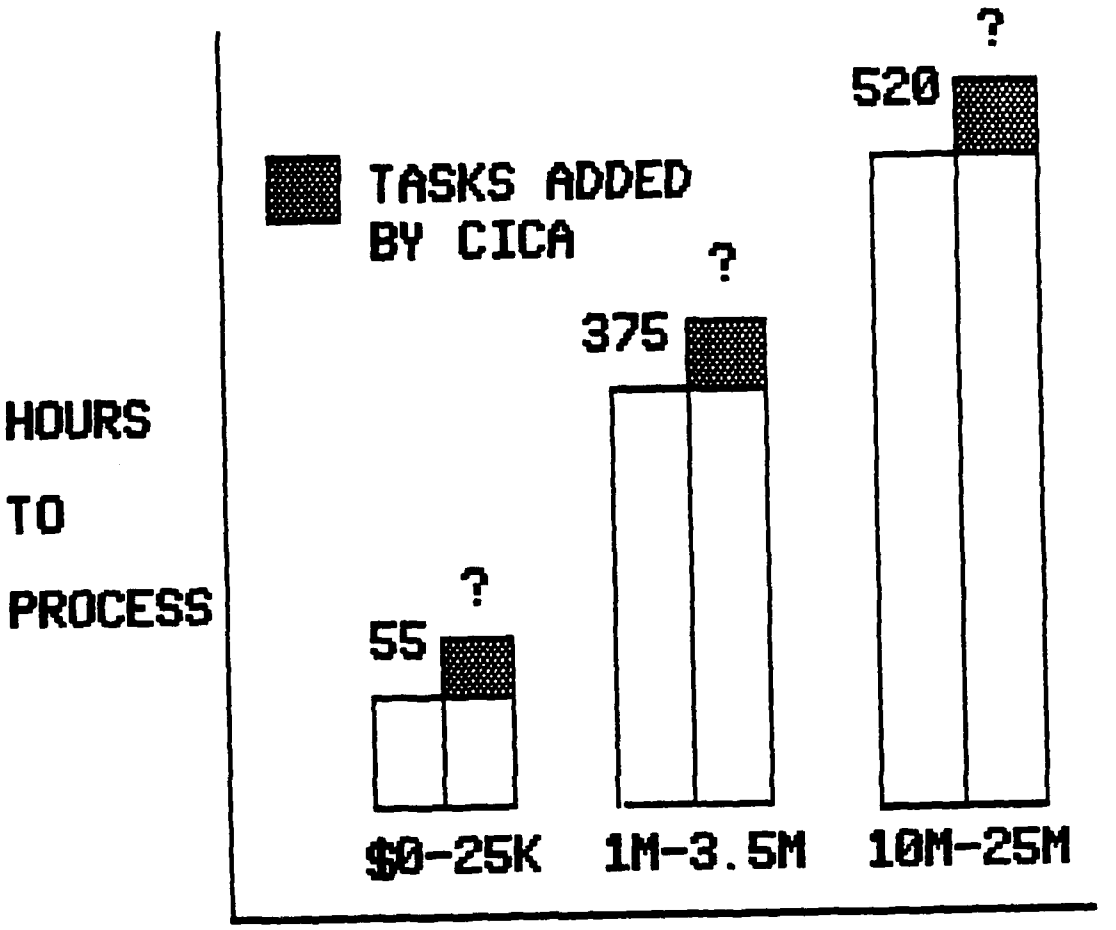
1. The Competition in Contracting Act (CICA) has greatly impacted the way we do business in DoD. Initially, we have focused on the success stories under CICA in evaluating its effects. There is evidence that CICA has resulted in a general reduction in contract prices by emphasizing competition.

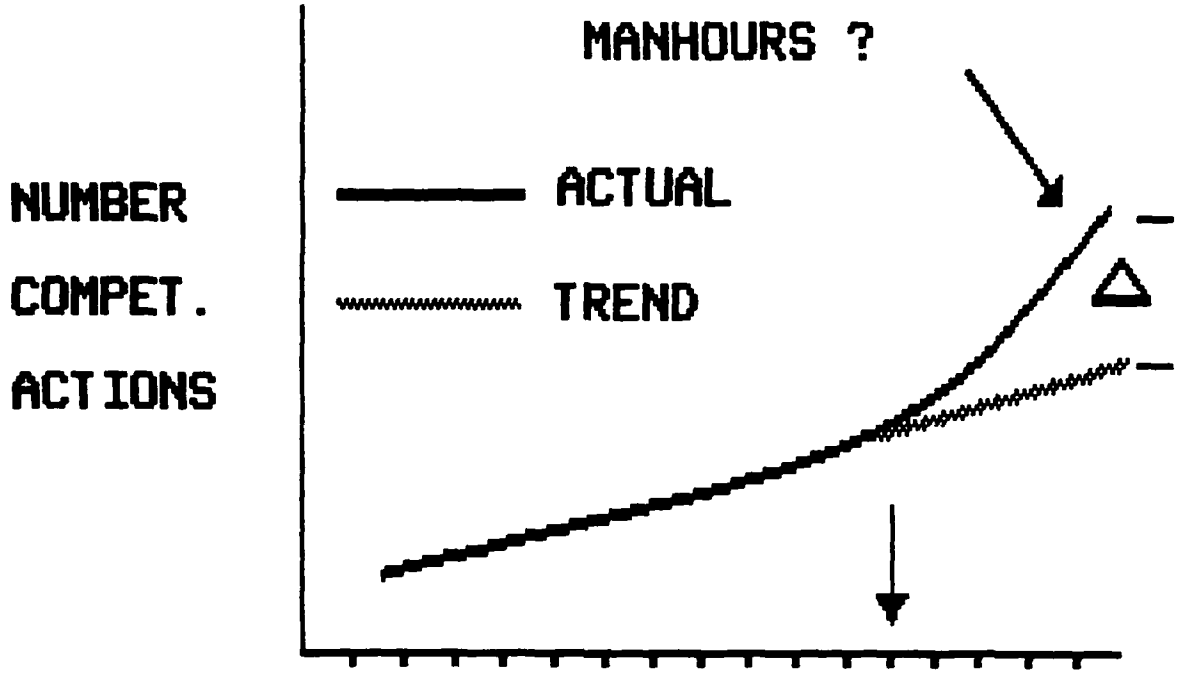
2. Now that CICA has been in place for over a year, we can begin to assess how its requirements are affecting our resources. To this end, Captain Mark Presar, a graduate student at the Air Force Institute of Technology, is currently studying the manpower impacts of CICA on the contracting workforce. Specifically, he will be analyzing the workload trends and changes brought about by CICA at the five major AFSC product divisions for his thesis effort.

3. The study will require Captain Presar to visit your organization and gather data during the next three months. His findings will be important to getting our arms around CICA's long term implications, and I urge your assistance in his work.

ANTHONY J. DELUCA
AFSC Competition Advocate

Appendix D: Informal Inbriefing Chart





COMPETITIVE VS

NON-COMPETITIVE ACTIONS

REQUIREMENTS FOR RESEARCH

- J & A LOG
- CURRENT ORGANIZATIONAL CHART
- HISTORICAL TOTAL $ OBLIGATED
- HISTORICAL ACTIONS

MY COMMITMENT TO YOU

- COMPLETE ANONYMITY
- A HARD LOOK AT THE DATA
- A LOOK ONLY AT THE DATA

Appendix E: H Code Listing

CODE	CATEGORY	OFFICE SYMBOL	OFFICE TITLE
HC01	Systems	SD/PM	Deputy for Contracting and Manufacturing
HC09	Systems	SD/PMJ	Directorate of Defense Meteorological Satellite Systems Contracts
HC39	Systems	SD/PMZA	Directorate of Defense Systems Contracts
HC47	Systems	SD/YBK	Directorate of Contracts Defense Dissemination Systems Program Office
HC60 thru HC64	Systems	SD/PML	Directorate of Space Communications Systems Contracts
HC70 thru HC75	Systems	SD/PMV	Directorate of Launch and Systems Control
HC80 thru HC83	Systems	SD/PMY	Directorate of Space Defense and Space Test Contracts
HM01	Systems	AD/PM	Deputy for Contracing and Manufacturing
HM04	Systems	AD/YIK	Directorate of Range Instrumentation Contracts
HM05	Systems	AD/YMK	Directorate of AMRAAM Contracting Division
HM06	Systems	AD/YGK	GBU-15 Contracting Division
HM07	Systems	AD/YNK	Directorate of Munitions & Armament Equipment Contracting
HM08	Systems	AD/YS	Directorate of Special Contracts

HM09	Systems	AD/YHK	Paveway Contracting Division
HT01	Systems	BMO/PK	Contracting Directorate
HU01	Systems	ASD/PM	Deputy for Contracting and Manufacturing
HU03	Systems	ASD/TAAK	Fighter/Attack SPO
HU16	Systems	ASD/AEKX	Life Support/Equipment SPO
HU25	Systems	ASD/B1K	Deputy for B-1B
HU28	Systems	ASD/YY	Deputy for Strategic Systems
HU29	Systems	ASD/AFK	Directorate of Airlift Modernization
HU30	Systems	ASD/C17	Deputy for C-17
HU36	Systems	ASD/TAMK	Maverick/RPV Contracts
HU40	Systems	ASD/TAFK	F-15 Contracting and Manufacturing Division
HU43	Systems	ASD/AEKA	Avionics and Aircraft Accessories Division
HU54	Systems	ASD/RWKE	PODS Contracting Office
HU55	Systems	ASD/YZKC-1	Engine Contracting Division C
HU57	Systems	ASD/YZKB	P&W F100 Engine Contracting
HU63	Systems	ASD/RWKS	PLS Systems Program Office
HU72	Systems	ASD/RWKR	Reconnaissance/Strike
HU75	Systems	ASD/TAS	Directorate Advance Tactical Fighter
HU77	Systems	ASD/TAXK	Deputy of A-10
HU82	Systems	ASD/YP	Deputy for F-16

HU86	Systems	ASD/YWK	Deputy for Simulator
HU89	Systems	ASD/YZKA	GE Engine Contracting
HV33	Systems	ESD/PKW	Directorate of AWACS Contracts
HV39	Systems	ESD/PKT	Directorate of Tactical Systems Contracts
HV40	Systems	ESD/PKG	Directorate of Intelligence and C3CM and Support Systems
HV41	Systems	ESD/PKY	Directorate of Systems Contracts
HV44	Systems	ESD/PKS	Directorate of Strategic Contracts

```
08/20/86  12:35:50  BEGIN SYSTEM 2000 - RELEASE 11.0
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USER,DEIF:
---
COMMAND FILE IS COMMANDS:
---
DBN IS OLD350:
 -556- OPENED.....OLD350
---
LIMIT 0:
---
REPORT TITLE IS REPRTIT:
---
LI/TITLE(132),D(45)REPORT FOR AFIT OLD350,F(60)PREPARED BY AMIS
---
L(13)CONTRACT-NO,B(1),L(4)H-CODE,B(2),
---
L(2)FY,B(2),L(1)FQ,B(2),L(1)COMP,B(2),L(1)MET,B(2),R(16)FACE-VALUE,B(2),
---
L(20)DESC-OF-ACT,B(1),R(10)DATE,B(2),L(1)C114,B(1),
---
L(1)C103,B(2),L(1)C113,B(2),L(1)KIND/C101,C102,C202,C203,C213,C211,
---
C229,C234,C233,C114,C103,C113,C210,OB C233,C229 WH
---
NOT C211 EQ J AND NOT C211 EQ 1 AND NOT C114 EQ M*P AND
---
NOT (C102 EQ A AND C113 EQ 4) AND C233 GE 04/01/80 AND
---
(C102 EQ HM01 OR C102 EQ HM04*HM09) AND
---
C210 SPANS 1*3:
---
  12:36:35  08/20/86   END  SYSTEM 2000 - RELEASE 11.0
```

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---
COMMAND FILE IS COMMANDS:
---
DBN IS DD350:
 -556- OPENED.....DD350
---
LIMIT 0:
---
LI/TITLE(132),D(45)REPORT FOR AFIT,F(60)PREPARED BY AMIS,
---
L(13)CONTRACT-NO,B(1),L(4)H-CODE,B(2),R(10)DATE-ACTION,B(2),
---
L(1)COMP,B(2),L(1)MET,B(2),R(16)FACE-VALUE,B(2),L(1)KIND-ACT,
---
B(2),L(35)DESC-OF-ACTION/C101,C204,C208,C222,C220,C234,C217,C215,
---
OB C208,C234 WH NOT C109 EQ 2 AND NOT C216 EQ 1 AND
---
NOT C107 SPANS A*E AND (C204 EQ HM01 OR C204 SPANS HM04*HM09)
---
AND
---
C217 SPANS 1*3:
---
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Appendix G: BMDP Data Runs

```
PAGE   1  BMDP1R

BMDP1R - MULTIPLE LINEAR REGRESSION

Copyright (C) Regents of University of California.

  BMDP Statistical Software, Inc.
  1964 Westwood Blvd.  Suite 202          Phone (213) 475-5700
  Los Angeles, California  90025             Telex  4992203

Program Version: April 1985
                 (VAX/UNIX)
Manual  Edition: 1983, 1985 reprint.  State NEWS in the PRINT
                 paragraph for a summary of new features.

Sat Aug 30 23:33:21 1986

PROGRAM CONTROL INFORMATION

/PROBLEM         TITLE IS 'THESIS'.
/INPUT                   VARIABLES ARE 2.
                FORMAT IS FREE.
                 CASES = 6.
                 FILE IS 'afsc.oh.data'.

/VARIABLE       NAMES ARE MANHOURS, YEAR.
                 ADD = 1.
                 WEIGHT = 3.
/TRANSFORM       X(3) = KASE LE 5.
/REGRESS        DEPENDENT IS MANHOURS.
                 INDEPENDENT IS YEAR.
/PLOT            NORMAL.
                 RESIDUALS.
/PRINT           DATA.
/END

***** TRAN      PARAGRAPH IS USED *****

PROBLEM TITLE IS
THESIS

NUMBER OF VARIABLES TO READ IN. . . . . .        2
NUMBER OF VARIABLES ADDED BY TRANSFORMATIONS. .  1
TOTAL NUMBER OF VARIABLES . . . . . .            3
NUMBER OF CASES TO READ IN. . . . . .            6
CASE LABELING VARIABLES . . . . . .
MISSING VALUES CHECKED BEFORE OR AFTER TRANS. . NEITHER
BLANKS ARE. . . . . . MISSING
INPUT FILE. . . . . .afsc.oh.data

REWIND INPUT FILE PRIOR TO READING. . DATA. . .     YES
NUMBER OF WORDS OF DYNAMIC STORAGE. . . . . .   25598

VARIABLES TO BE USED
     1 MANHOURS    2 YEAR        3 X(3)

INPUT FORMAT IS
FREE

MAXIMUM LENGTH DATA RECORD IS   80 CHARACTERS.
  REGRESSION INTERCEPT. . . . . .NON-ZERO
  GROUPING VARIABLE . . . . . .
  WEIGHT VARIABLE . . . . . .X(3)
  PRINT COVARIANCE MATRIX . . . . . .      NO
  PRINT CORRELATION MATRIX. . . . . .      NO
```

PRINT CORRELATION OF REGRESSION COEFFICIENTS. . NO
PRINT RESIDUALS . . . . . YES
PRINT NORMAL PROBABILITY PLOT . . . . . YES
PRINT DETRENDED NORMAL PROBABILITY PLOT . . . . YES

NUMBER OF CASES READ. 6
CASES WITH ZERO WEIGHT 1
REMAINING NUMBER OF CASES 5

VARIABLE	WEIGHTED MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION	MINIMUM	MAXIMUM
1 MANHOURS	160140.4063	45280.1172	0.28275	107483.00000	274182.00000
2 YEAR	3.0000	1.5811	0.52705	1.00000	6.00000

DEPENDENT VARIABLE. . . . . 1 MANHOURS
TOLERANCE 0.0100
ALL DATA CONSIDERED AS A SINGLE GROUP

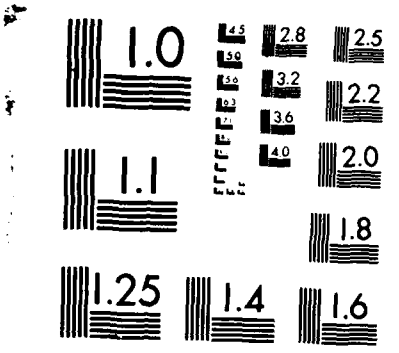
MULTIPLE R 0.9381 STD. ERROR OF EST. 18113.5723
MULTIPLE R-SQUARE 0.8800

ANALYSIS OF VARIANCE

	SUM OF SQUARES	DF	MEAN SQUARE	F RATIO	P(TAIL)
REGRESSION	7216851968.0000	1	7216851968.0000	21.996	0.0183
RESIDUAL	984304640.0000	3	328101536.0000		

VARIABLE		COEFFICIENT	STD. ERROR	STD. REG COEFF	T	P(2 TAIL)	TOLERANCE
INTERCEPT		79547.80469					
YEAR	2	26864.20117	5728.01465	0.938	4.690	0.0183	1.00000

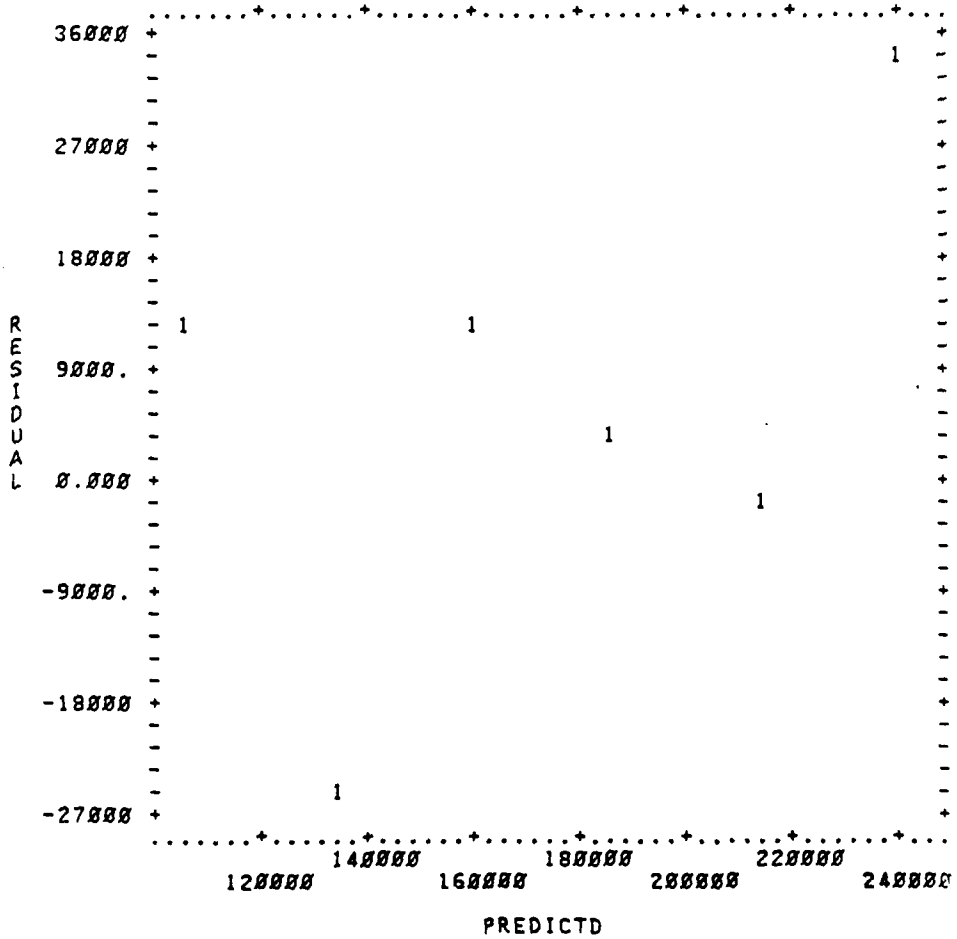
AD-A174 458 ASSESSING THE IMPACT OF RECENT COMPETITION RELATED 2/2
LEGISLATION ON THE WOR (U) AIR FORCE INST OF TECH
WRIGHT-PATTESSON AFB OH SCHOOL OF SYST M E PRESAR
UNCLASSIFIED SEP 86 AFIT/GLM/LSM/86S-61 F/G 5/1 NL



LIST OF PREDICTED VALUES, RESIDUALS, AND VARIABLES
NOTE - NEGATIVE CASE NUMBER DENOTES A CASE WITH MISSING VALUES.
THE NUMBER OF STANDARD DEVIATIONS FROM THE MEAN IS DENOTED BY UP TO 3 ASTERISKS TO THE RIGHT OF EACH RESIDUAL OR VARIABLE.
MISSING VALUES AND VALUES OUT OF RANGE ARE DENOTED BY VALUES GREATER THAN OR EQUAL TO Ø.2127e+38 IN ABSOLUTE VALUE.

CASE LABEL	NO.	RESIDUAL	PREDICTED VALUE	VARIABLES 1 MANHOURS	2 YEAR	
	1	Ø.1244e+Ø5	Ø.1Ø64e+Ø6	Ø.1189e+Ø6	1.ØØØ	*
	2	-Ø.2579e+Ø5*	Ø.1333e+Ø6	Ø.1Ø75e+Ø6*	2.ØØØ	
	3	Ø.123Øe+Ø5	Ø.16Ø1e+Ø6	Ø.1724e+Ø6	3.ØØØ	
	4	2996.	Ø.187Øe+Ø6	Ø.19ØØe+Ø6	4.ØØØ	
	5	-1951.	Ø.2139e+Ø6	Ø.2119e+Ø6*	5.ØØØ	*
	6	Ø.3345e+Ø5*	Ø.24Ø7e+Ø6	Ø.2742e+Ø6**	6.ØØØ	*

SERIAL CORRELATION OF RESIDUALS = -Ø.6721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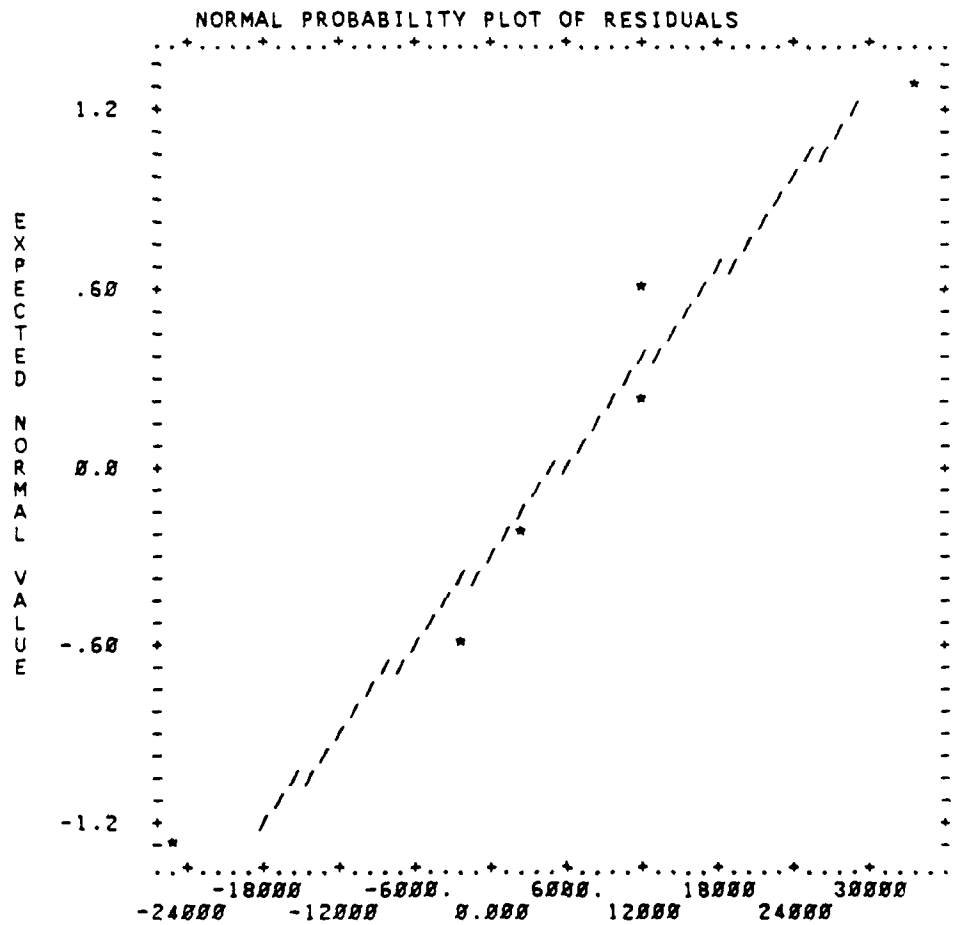

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Appendix H: Average Grade Calcuation

Air Force Systems C mmand

Direct Systems Buying Personnel

Grade	Total Personnel	Grade Weighting (Grade X Total)
GS/GM14	35	490
GS/GM13	140	1820
GS12	345	4140
GS11	96	1056
GS09	93	837
GS07	48	336
GS06	38	228
GS05	154	770
GS04	21	84
GS03	4	12
GS02	2	4
TOTAL	976	9777

$$\frac{\text{Grade Weighting Total}}{\text{Personnel Total}} = \frac{9777}{976} = 10.017, \text{ round to GS10}$$

Appendix I: Accelerated Salary Factors

(from AFR 173-13)
Revised Table 3-13
Application of Civilian Base Pay Acceleration Factors
Fiscal Year 1985
(Effective 1 January 1985)(1)

Pay Grade	Standard Composite Pay Rate	Base Pay Rate(2)	Accelerated Annual Pay(3)	Accelerated Hourly Pay (Direct Workhour)(4)(5)
GS-01	11,226	9,640	13,149	7.43
GS-02	12,855	11,039	15,057	8.51
GS-03	14,763	12,678	17,293	9.78
GS-04	16,960	14,564	19,865	11.23
GS-05	19,449	16,702	22,782	12.88
GS-06	22,165	19,034	25,962	14.68
GS-07	24,037	20,641	28,154	15.92
GS-08	27,277	23,424	31,950	18.06
GS-09	29,412	25,257	34,451	19.48
GS-10	33,442	28,718	39,171	22.15
GS-11	35,334	30,343	41,388	23.40
GS-12	42,805	36,758	50,138	28.35
GS/GM-13	51,787	44,471	60,658	34.30
GS/GM-14	61,523	52,832	72,063	40.74
GS/GM-15	69,926	60,048	81,905	46.31
GS-16	72,893	62,596	85,381	48.27
GS-17	81,548	68,700(6)	93,707	52.98
GS-18	81,548	68,700(6)	93,707	52.98
ES-01	72,734	62,459	85,194	48.17
ES-02	75,671	64,982	88,635	50.11
ES-03	78,610	67,505	92,077	52.06
ES-04	81,548	68,700(6)	93,707	52.98
ES-05	81,548	70,028	95,518	54.01
ES-06	81,548	70,028	95,518	54.01

(1) This table does not apply for A-76 Commercial Activity (CA) studies. Refer to OMB Circular A-76/Cost Comparison Handbook (4 Aug 83).

(2) The Standard Composite Pay Rate divided by 1.1645 (FY 85 rate adjustment for those AF funded retirement and benfit costs that are over and above the civilian base pay rate) equals the Base Pay Rate.

(3) Includes total (funded and unfunded) retirement and benefit costs: Base Pay Rate increase by 36.4%.

(4) Includes retirement, benfits, and leave and holiday costs: Accelerated Annual Pay divided by 2087 hours, increased by 18% for leave and holiday.

(5) The 18% leave and holiday factor compensates civilian personnel for wages paid during leave and holiday periods. This factor is applicable only when reimbursements are based on time actually worked. (Do not use this factor if the assignment is full time.)

(6) General Schedule (GS) Base Pay is limited to $68,700. Senior Executive Service (SES) Base Pay is limited to $68,700 for ES-01 through ES-04, $70,500 for ES-05, and $72,300 for ES-06

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VITA

Captain Mark E. Presar was born on 5 April 1956 in Lima, Ohio. He graduated from Wapakoneta Senior High School in Wapakoneta, Ohio in 1974. After enlisting in the Air Force and spending one year as a Physiological Training Specialist, Captain Presar received a scholarship through the Airman Scholarship and Commissioning Program. He attended Ohio State University for one year, and graduated from Ohio University in Athens with a Bachelor's degree in Communication Management. He was a Distinguished Military Graduate from Ohio University's AFROTC Detachment 650. He served at the Base Contracting Division, Griffiss AFB NY, from 4 November 1980 to 12 September 1982 as a Contracts Management Officer. Captain Presar was then assigned to the Deputy for Contracting and Manufacturing, Aeronautical Systems Division, Wright-Patterson AFB OH. There he performed duties as a Research and Development Contracts Manager and Staff Officer until entering AFIT in May 1985.

Permanent Address: 115 Cherry Lane
Wapakoneta, OH 45895

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Thesis Advisor: Gary L. Delaney, LtCol, USAF

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Public Law 98-369, The Competition in Contracting Act and Public Law 98-72, Commerce Business Daily, were recently enacted in response to "horror stories" regarding the Defense Department's supposed overspending on weapon systems and support equipment acquisitions. These two laws have brought sweeping changes to the Government acquisition process, in terms of new requirements for the processing of sole source and other less fully competitive actions, and in terms of the activities required to promote, enhance and sustain competitive procurement.

Although there have already been cost avoidance success stories resulting from this increased use of competition, very little attention has been given to the cost impact of implementing the revised procedures. This research focused on the changes in manhours, and payroll and benefit costs, required to comply with these new laws within Air Force systems buying activities. Extensive historical data were collected and over 70 personal interviews were conducted at Air Force Systems Command buying divisions at Eglin AFB FL, Wright-Patterson AFB OH, Norton AFB CA, Hanscom AFB MA, and Los Angeles AFS CA to determine the average times spent on the new procedures required for acquisitions with less than full and open competition. These processing time changes were then converted into payroll and benefit costs to assess the monetary impact. Additionally, linear regression and forecasting models were used to test for a workload shift toward the more labor intensive competitive source selection procedures which appeared to increase after the legislations' effective date.

The results of the interviews and the analysis of historical data revealed additional payroll and benefit costs in excess of $1 million. Perceptions of the workforce regarding the laws, along with conclusions, recommendations, and areas for further study, are presented.

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